



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2009/2010**

SUBJECT : MECHANICAL AND ELECTRICAL  
SYSTEM

SUBJECT CODE : BFC3153

COURSE : 3 BFF / 3 BFI

EXAMINATION DATE : APRIL / MAY 2010

DURATION : 3 HOURS

INSTRUCTION : ANSWER ALL QUESTIONS IN  
**PART A AND THREE (3)**  
QUESTIONS ONLY IN **PART B.**

THIS PAPER CONSISTS SEVEN (7) PAGES

**PART A**

**A. Choose the correct answer.**

1. 'The state of being able to pursue some activity without experiencing environmental distress' is the definition of;
  - A. Building comfort
  - B. Environmental comfort
  - C. Comfort
  - D. Thermal comfort
  
2. An improved microclimate around a building brings the following types of benefits, except;
  - A. Longer life for building materials
  - B. Increase of rainfall in the region
  - C. Lower energy cost in winter
  - D. Increased user satisfaction and value
  
3. \_\_\_\_\_ is the amount of heat required to raise the temperature of an object or substance one degree.
  - A. Temperature gain
  - B. Heat capacity
  - C. Heat gain
  - D. Heat density
  
4. A plane wall constructed of solid iron with thermal conductivity  $80 \text{ W/mC}^\circ$ , thickness 50 mm and with surface area 2 m by 2 m, temperature  $120^\circ\text{C}$  on one side and  $80^\circ\text{C}$  on the other. The conductive heat transfer is;
  - A. 98 kW
  - B. 184 kW
  - C. 102 kW
  - D. 162kW
  
5. Which one of the following is not a component of an active system of M&E;
  - A. Building Automation System
  - B. Sprinkler system
  - C. Mechanical ventilation system
  - D. Building envelope system
  
6. Which of the following holds waste from homes when a sewer line is not available?
  - A. Outhouse
  - B. Wells
  - C. Septic tank
  - D. Aquifer
  
7. The limit of  $\text{CO}_2$  level stated in the DOSH Code of Practice on Indoor Air Quality 2005 is;
  - A. 1200 ppm
  - B. 1000 ppm
  - C.  $1000 \text{ mg/m}^3$
  - D.  $1200 \text{ mg/m}^3$

8. Based on the MS1525:2007 Code of Practice on Energy Efficiency, the indoor design condition for dry bulb temperature and humidity is;
- A. 23-26°C, 55%-70%
  - B. 22-25°C, 50%-60%
  - C. 24-27°C, 50%-70%
  - D. 22-26°C, 50%-60%
9. Factors affect surface resistance through these mechanism listed below, except;
- A. Thermal sensitivity
  - B. Climatic affects
  - C. Direction of heat flow
  - D. Surface properties
10. Calculate the applied voltage if 3 mA flows through a circuits resistance of 25 kΩ.
- A. 63 mV
  - B. 25 V
  - C. 75 μV
  - D. 75 V
11. Conductors offer a \_\_\_\_\_ resistance to current flow.
- A. high
  - B. low
  - C. medium
  - D. maximum
12. If AC stands for Alternating Current, what does DC stand for?
- A. Delivery Current
  - B. Direct Current
  - C. Diverted Current
  - D. Delta Current
13. What is the content circulation of water from the atmosphere to the land and the oceans and back again?
- A. Twister
  - B. Water cycle
  - C. Weather
  - D. Hydraulic
14. Name the place where the water is treated to make if safe to drink?
- A. Water treatment plant
  - B. Wastewater treatment plant
  - C. Dry cleaners
  - D. Plantation
15. The number of elevators needed for a building is related to the following except;
- A. Building population
  - B. Building occupancy
  - C. Number of entrance
  - D. Number of floors

**B. Fill in the blanks with the correct answer.**

1. \_\_\_\_\_ is the situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified.
2. The sources of casual heat gain in buildings are \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ and \_\_\_\_\_ .
3. The pressure difference that affect air movement is caused by \_\_\_\_\_ , \_\_\_\_\_ and \_\_\_\_\_ .
4. Air conditions are to maintain \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ and \_\_\_\_\_ within an indoor environment.
5. OSHA defined an escape route as a \_\_\_\_\_ and \_\_\_\_\_ path of exit travel from any point within a workplace to a place of safety.

**C. Indicate which of the following TRUE or FALSE**

1. A dry pipe sprinkler system uses dry powder to extinguish fire when activated. (True/False)
2. Class B fires involve flammable gases, liquids, and greases, including gasoline and most hydrocarbon liquids which must be vaporized for combustion to occur. (True/False)
3. The ability of water to stabilize temperature depends on its relatively high specific heat. (True/false)
4. Two 12V batteries wired in series produce 24V. (True/false)
5. The atmospheric boiling point of water is 100 degrees Celsius (212 degrees Fahrenheit). (True/false)

**PART B**

Answer three (3) questions.

- Q1** (a) State **three (3)** advantages of cold water supply below:
- (i) Direct System
  - (ii) Indirect System
- (6 marks)
- (b) Describe the term passive control components in a building and give **three (3)** examples of such components.
- (5 marks)
- (c) Give the SI units for:
- (i) Heat
  - (ii) Power
  - (iii) Heat capacity
  - (iv) Thermal conductivity
- (4 marks)
- (d) “The process of urbanization requires tall buildings and skyscrapers to accommodate a large number people. Despite all the benefits, tall buildings consume much more energy and contribute more to pollution in urban areas.”
- Discuss the statement above.
- (10 marks)
- Q2** (a) Natural ventilation is provided by the following two broad mechanisms, air pressure difference and stack effect. Briefly explain both of these mechanisms work in providing natural ventilation for buildings.
- (5 marks)
- (b) In order to design a building which is appropriate for its site, the climate of that site needs to be studied and predicted. Identify the **five (5)** climate factors that should be considered.
- (5 marks)
- (c) A certain un-insulated cavity wall has a U-value of  $0.91\text{W/m}^2\text{K}$ . If insulation board is added to the construction, calculate the minimum thickness of this board is needed to reduce the U-value to  $0.35\text{W/m}^2\text{K}$ ? Given that the thermal conductivity of the insulation board is  $0.025\text{W/mK}$ .
- (10 marks)
- (d) List down **five (5)** indoor contaminants and its maximum limit as stated in the Code of Practice on Indoor Air Quality 2005, DOSH Malaysia.
- (5 marks)

- Q3** (a) Describe the term active control systems in a building and give **three (3)** examples of such systems. (6 marks)
- (b) Design the main water storage tank capacity if a unit condominium has 2 hand wash basin, 2 showers, 1 bath, 2 WC and 1 wash up sink. Height of this condominium is 20 meter with 8 storey and 2 units of house at every level. (10 marks)

*Table 1: Volumes of water required for single use of appliances.*

Appliance	Volume required in liters
Wash Basin:	
Hand wash	5
Hand and face wash	10
Hair wash	20
Shower	40
Bath	110
W.C.	10
Washing machine	150
Sink:	
Wash up	15
Cleaning	10

- (c) State **four (4)** disadvantages of using a dry pipe sprinkler system in a building. (4 marks)
- (d) Namely equipment to measure :
- (i) Resistance
  - (ii) Current
  - (iii) Voltage
  - (iv) Power
  - (v) Energy
- (5 marks)

- Q4**
- (a) Determine the meaning of direct current (DC) and alternating current (AC) and give **two (2)** example of appliances that use the specific currents. (6 marks)
  - (b) Using Ohm's Law, calculate :
    - (i) The current taken by a heater with a resistance of  $24 \Omega$  when connected to a 120V supply
    - (ii) The resistance of a toaster is connected to a 120 V supply and draws 8 A.
    - (iii) The voltage must be applied to a  $6.4 \Omega$  lamp filament to develop 20 A of current. (6 marks)
  - (c) Sketch a water storage tank with the basic requirements. (5 marks)
  - (d) Elevators energy consumption in office buildings is generally considered to be about 5% of building electricity use. Although the amount seems small, it has a potential to create move saving in terms of its energy consumption. Discuss the opportunities for elevator energy efficiency improvements. (8 marks)